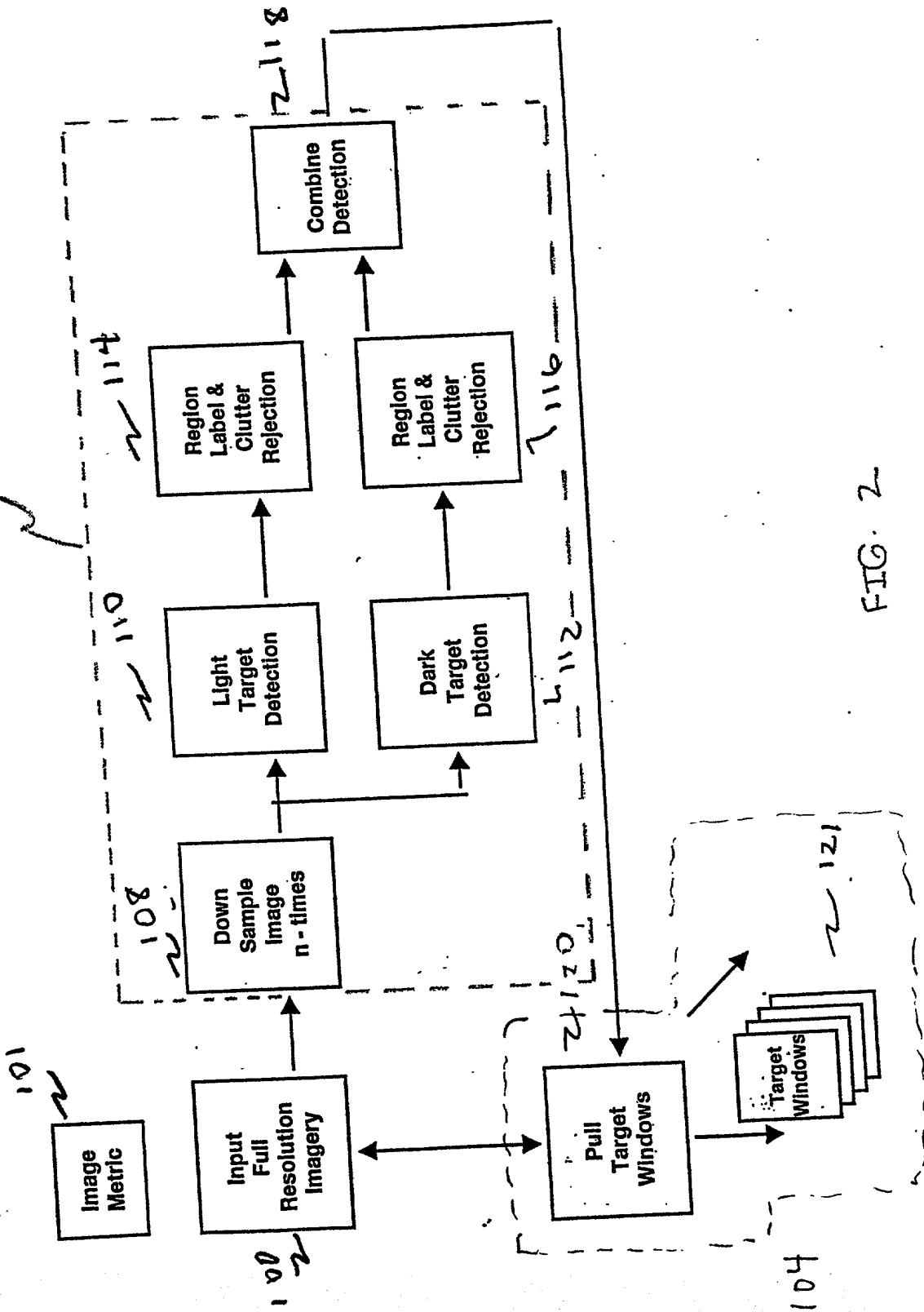
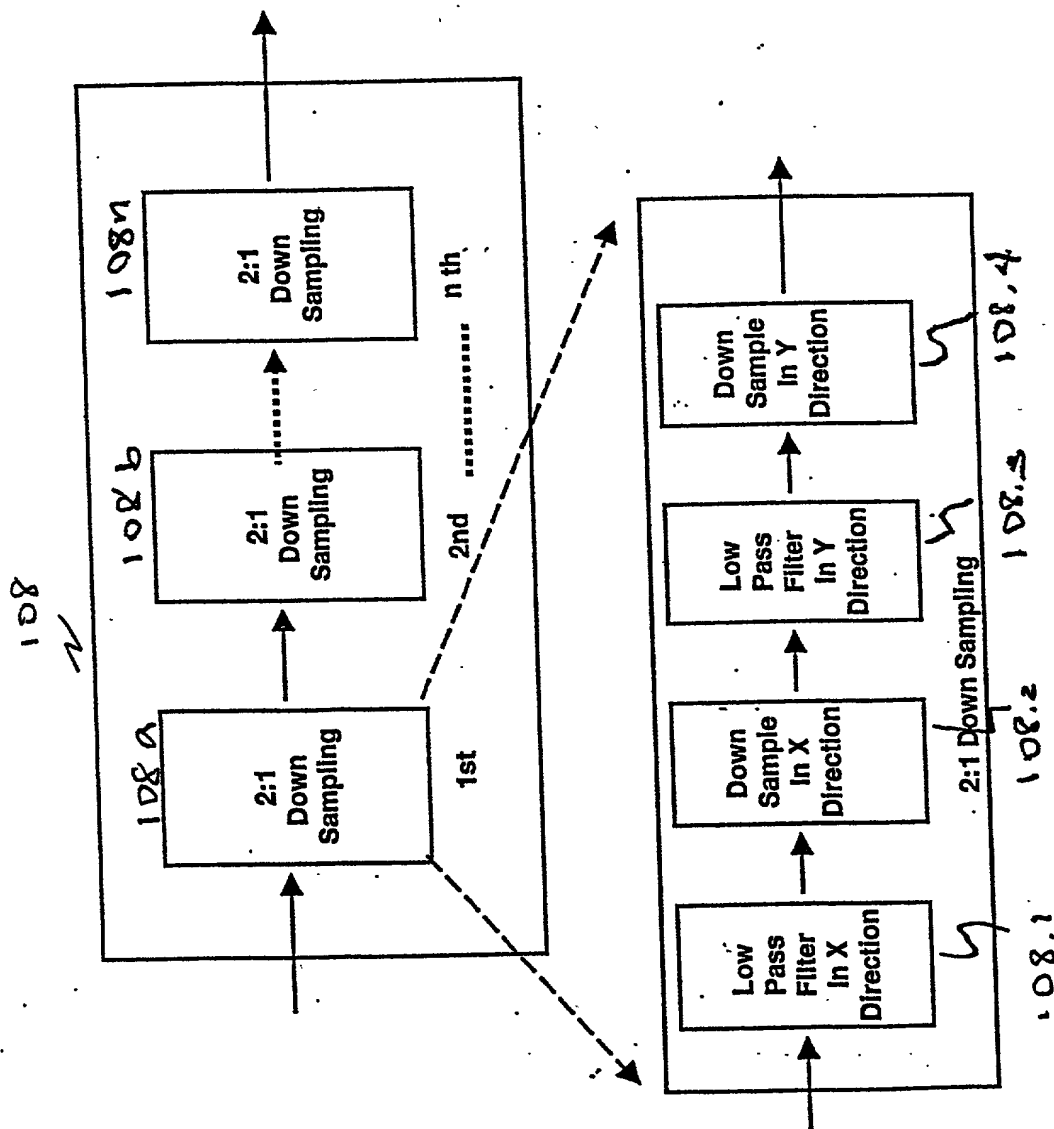


FIG. 1





304

1	4	6	4	1
4	16	24	16	4
6	24	36	24	6
4	16	24	16	4
1	4	6	4	1

Full
6 by 6
Convolution
Filter

301

1	4	6	4	1
---	---	---	---	---

302

1	4	6	4	1
---	---	---	---	---

X Direction Filter

Y Direction Filter

FIG 3B

FIG. 3A

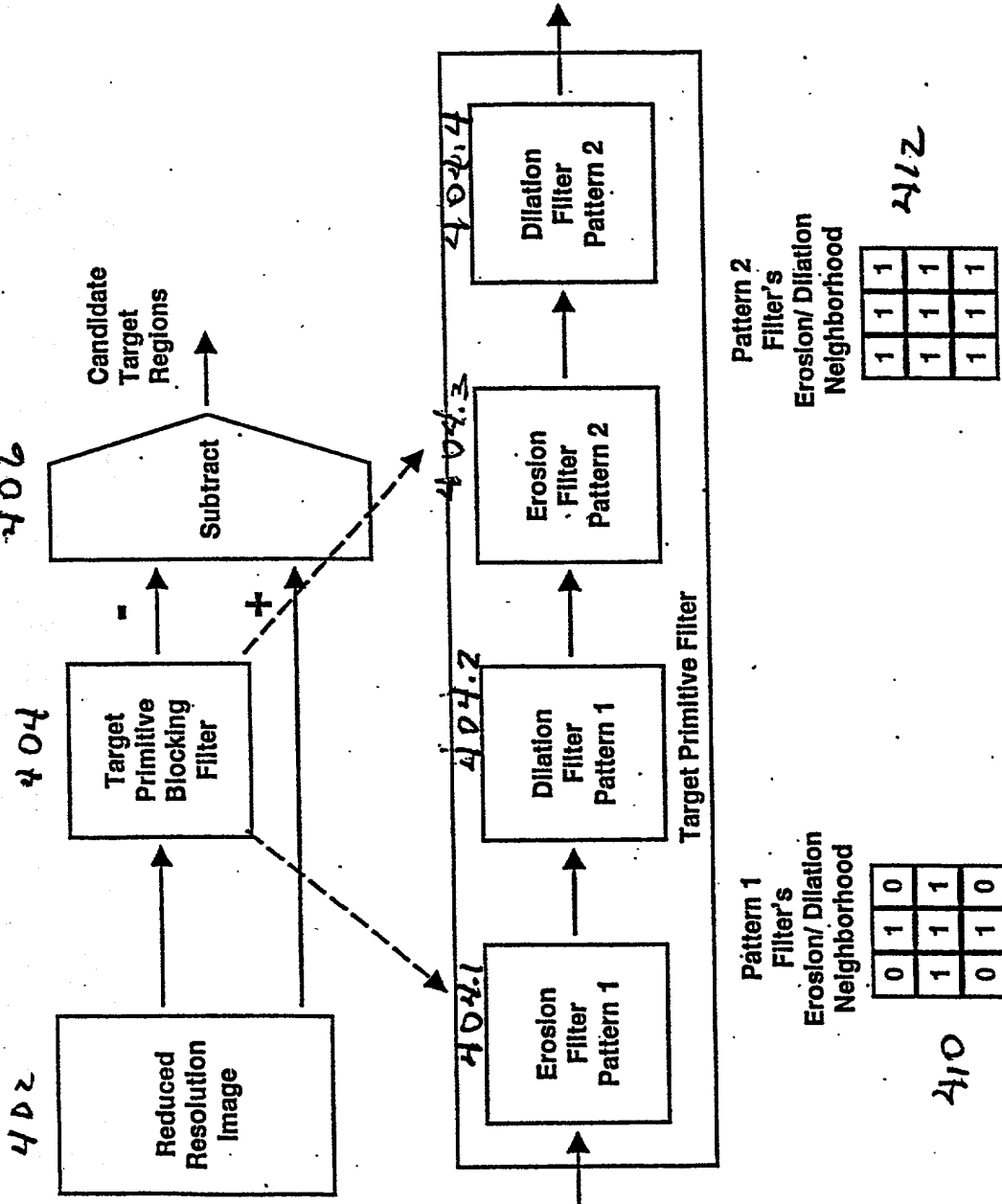


FIG. 4

Filter Pattern 1

$$\begin{array}{c} \text{Input Image} \\ \text{Pixels} \end{array} \begin{array}{|c|c|c|} \hline a & b & c \\ \hline d & e & f \\ \hline g & h & i \\ \hline \end{array} \begin{array}{c} \ominus \\ \text{Erosion} \\ \text{Neighborhood} \end{array} \begin{array}{|c|c|c|} \hline 0 & 1 & 0 \\ \hline 1 & 1 & 1 \\ \hline 0 & 1 & 0 \\ \hline \end{array} = \begin{array}{c} \text{Output Image} \\ \text{Pixels} \end{array} \begin{array}{|c|c|c|} \hline a' & b' & c' \\ \hline d' & e' & f' \\ \hline g' & h' & i' \\ \hline \end{array} \begin{array}{c} \text{503} \\ \text{where } e' = \text{Minimum of } \{b, d, e, f, h\} \end{array}$$

Filter Pattern 2

$$\begin{array}{c} \text{Input Image} \\ \text{Pixels} \end{array} \begin{array}{|c|c|c|} \hline a & b & c \\ \hline d & e & f \\ \hline g & h & i \\ \hline \end{array} \begin{array}{c} \ominus \\ \text{Erosion} \\ \text{Neighborhood} \end{array} \begin{array}{|c|c|c|} \hline 1 & 1 & 1 \\ \hline 1 & 1 & 1 \\ \hline 1 & 1 & 1 \\ \hline \end{array} = \begin{array}{c} \text{Output Image} \\ \text{Pixels} \end{array} \begin{array}{|c|c|c|} \hline a' & b' & c' \\ \hline d' & e' & f' \\ \hline g' & h' & i' \\ \hline \end{array} \begin{array}{c} \text{506} \\ \text{505} \end{array}$$

FIG. 5A

Filter Pattern 1

a	b	c
d	e	f
g	h	i

 \oplus

0	1	0
1	1	1
0	1	0

 $\xrightarrow{508}$

a'	b'	c'
b'	e'	f'
g'	h'	i'

 $\xrightarrow{510}$

a'	b'	c'
b'	e'	f'
g'	h'	i'

where $e' = \text{maximum of } \{b, d, e, f, h\}$

Filter Pattern 2

a	b	c
d	e	f
g	h	i

 \oplus

1	1	1
1	1	1
1	1	1

 $\xrightarrow{512}$

a'	b'	c'
b'	e'	f'
g'	h'	i'

 $\xrightarrow{513}$

a'	b'	c'
b'	e'	f'
g'	h'	i'

where $e' = \text{maximum of } \{a, b, c, d, e, f, g, h, i\}$

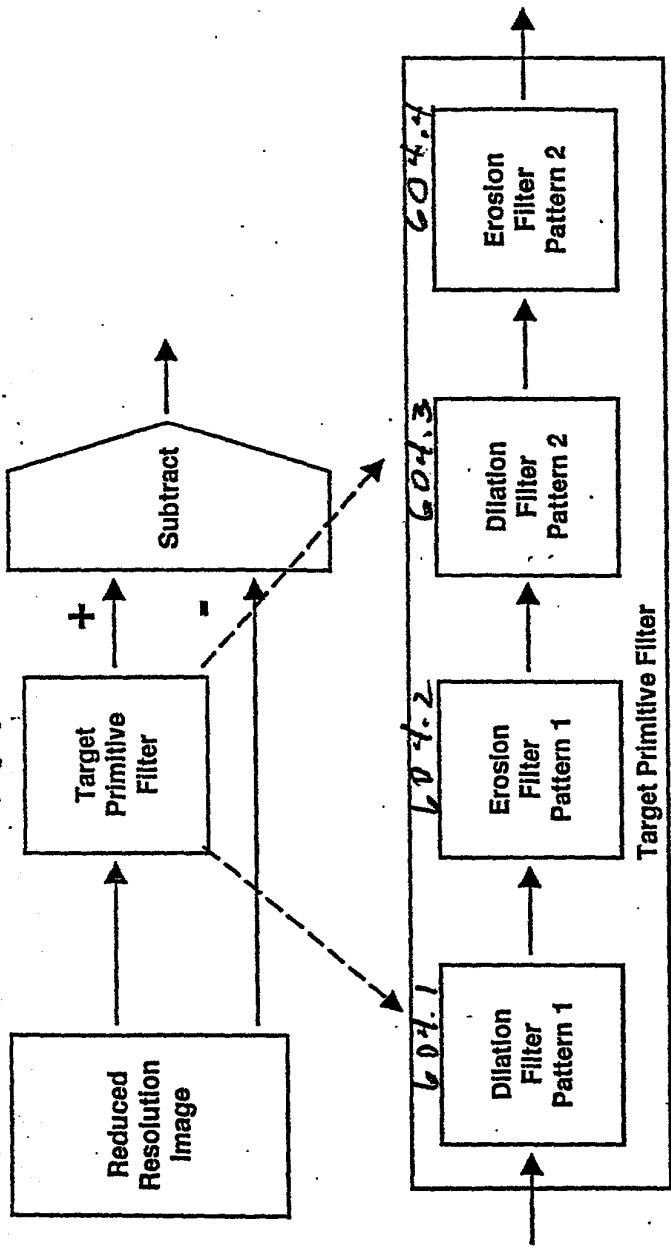
FIG. 5B

FOOTNOTES

602

604

606



Pattern 1
Filter's

Dilation/ Erosion
Neighborhood

0	1	0
1	1	1
0	1	0

612

Pattern 2
Filter's

Dilation/ Erosion
Neighborhood

1	1	1
1	1	1
1	1	1

614

FIG. 6

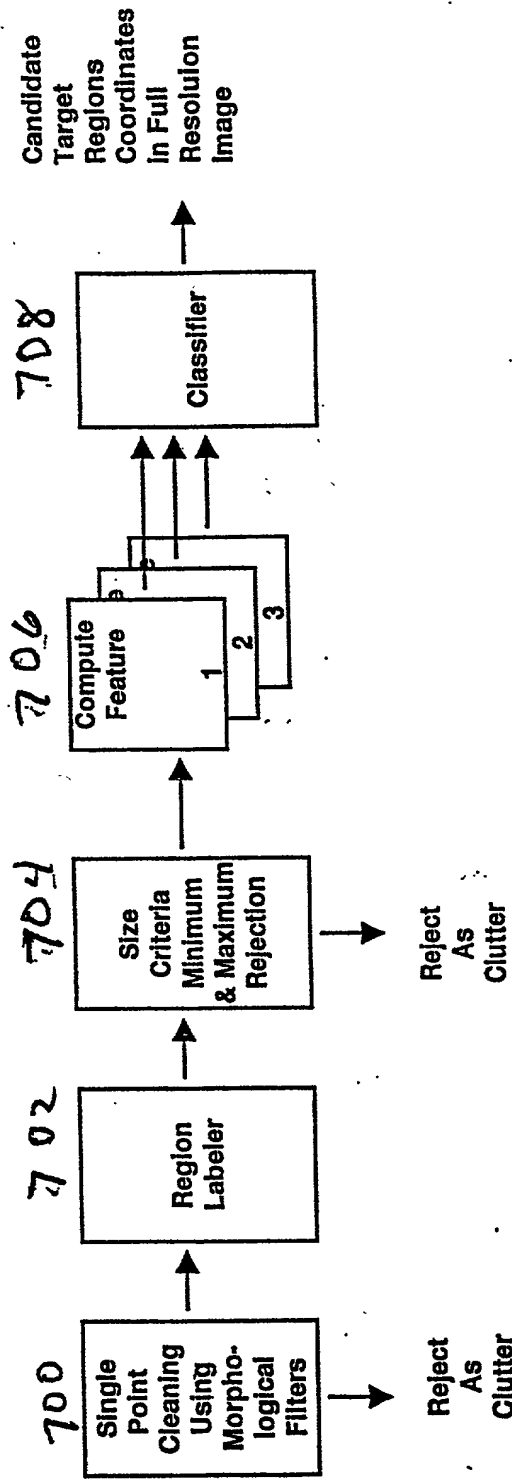


FIG. 7